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The *Pseudagrion ignifer* complex from Australia (Odonata: Zygoptera: Coenagrionidae)

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A b s t r a c t: *Pseudagrion ignifer* is found to be complex. It includes three morphologically distinct groups of populations. These groups of populations are considered as two species with one of them comprising two subspecies. One species, *Pseudagrion lucifer*, and one subspecies, *Pseudagrion ignifer aureum*, are described as new.

K e y w o r d s : *Pseudagrion ignifer* complex; Australia.

Introduction

TILLYARD (1906) described both sexes of *Pseudagrion ignifer* from north-eastern Queensland (localities given: Kuranda, Atherton, Cairns). TILLYARD (1913) redescribed the male anal appendages, commented on the affinities of the species and added the localities Cooktown on Cape York Peninsula and Bellinger River in New South Wales. RIS (1915) keyed out *P. ignifer* from several species from New Guinea and recorded it from Bellinger River, from Kuranda and from Cape York, remarking that the Cape York specimen was smaller than the other material; Ris' illustration appears to show typical *P. ignifer*. SJÖSTEDT (1917) recorded material from Atherton and Bellenden Ker in north-eastern Queensland. TILLYARD (1926) presented a photograph of a male specimen and referred to the reddish face of *P. ignifer*. LIEFTINCK (1933) recorded and described both sexes from Northern Territory. LIEFTINCK (1951) recorded material from Iron Range and from Batavia (Wenlock) River, Wenlock, 500 ft, both on Cape York Peninsula. FRASER (1960) mentioned *P. ignifer* from Queensland, New South Wales and Northern Territory. WATSON et al. (1991) finally recorded *P. ignifer* from the Kimberleys (Western Australia), from Cape York, from north-eastern, south-eastern and southern inland Queensland and from north-eastern New South Wales.

Recent analysis of all available material of "*Pseudagrion ignifer*" revealed that it includes three distinct groups of populations. The magnitude of the morphological differences between these groups, the absence of major variations within each group

and of intermediate forms, and the zoogeographical situation indicate that "*Pseudagrion ignifer*" is a complex of two distinct species, with one of them comprising two subspecies. Below, this complex is defined, and one species and one subspecies are named and compared with typical *Pseudagrion ignifer*.

In the diagnoses, the terminology follows CHAO (1953) and WATSON & O'FARRELL (1991).

The material referred to is held in the Australian Museum, Sydney (AM), in the Australian National Insect Collection, CSIRO Canberra (ANIC).

Other non-selfexplanatory abbreviation used in this paper:

Ck(s) Creeks(s)

mi. miles

n. o. d. no other data

nr near

P paratype

R River

Ra. Range(s)

Rd. Road

Res. Reserve

s. l. same locality

trib. tributary

The *Pseudagrion ignifer* complex (Figs 1-10)

Diagnostic characters: 12-15 postnodal crossveins. Face of male yellow to orange; synthorax with extensive brown to yellow areas, sometimes pruinescent; front of synthorax black or brown; end of abdomen either blackish brown, often pruinescent, or bright blue on much of segments 8 and 9. Female with abdominal segments 3-5 brownish black above except for narrow pale band at extreme base, and with lateral margins of dark upper surface almost straight.

Distribution: Australian region: Australia: northern and eastern Australia.

Two species: *P. ignifer* TILLYARD, *P. lucifer* spec. nov.

***Pseudagrion ignifer* TILLYARD (Figs 1-6)**

Pseudagrion ignifer TILLYARD 1906: 188.

Pseudagrion ignifer TILLYARD; TILLYARD 1913: 469; RIS 1915: 98; SJÖSTEDT 1917: 37; TILLYARD 1926: 77; LIEFTINCK 1951: 24; FRASER 1960: 16 (part); WATSON 1974: 141 (part); THEISCHINGER & WATSON 1979: 27; HOUSTON & WATSON 1988: 50 (part); WATSON et al. 1991: 132, 133 (part); WATSON & HOUSTON 1994: 26 (part).

Primary type: Lectotype ♂: Queensland, Kuranda, Dec. 1904, R. J. TILLYARD; not seen.

Diagnostic characters: Length of hindwing, male 20.0-26.0 mm, female 22.0-28.0 mm. Mature male with face yellow to orange and with sides of synthorax and abdominal segments 1, 2 and 7-10 mostly pruinescent; superior anal appendages of male with caudal face of variable length, more or less than twice as long as wide, inner end truncate.

Distribution: Eastern Australia.

Two subspecies: *P. i. ignifer* TILLYARD, *P. i. aureum* subsp. nov.

***Pseudagrion ignifer ignifer* TILLYARD (Figs 1-3)**

Pseudagrion ignifer TILLYARD 1906: 188.

Pseudagrion ignifer TILLYARD; TILLYARD 1913: 469 (part); RIS 1915: 98 (part); SJÖSTEDT 1917: 37; TILLYARD 1926: 77 (part); FRASER 1960: 16 (part); WATSON 1974: 141 (part); THEISCHINGER & WATSON 1979: 27; HOUSTON & WATSON 1988: 50 (part); WATSON et al. 1991: 132, 133 (part); WATSON & HOUSTON 1994: 26 (part).

Primary type: see above, under *P. ignifer*.

Material examined: Queensland: 1♂, trib. of Apis Ck, nr Marlborough, 13.11.1976, G. Theischinger (GT); 1♂, Atherton, Apr. 1907, E. Allen, 4♂♂, 1♀, s. l., Jan. 1963, C. Vallis (ANIC); 1♂, Bamboo Ck, nr Miallo, N of Mossman, 25.4.1967, D.H. Colless (ANIC); 1♂, Ban Ban Springs, 1.11.1980, G. Theischinger (GT); 1♂, Barron R., Kuranda, 2.10.1955, R. Dobson, 1♂, 2♀♀, s. l., 20.4.1965, C.W. Frazier (ANIC); 1♂, Barron R., Mareeba, 6.11.1966, J.A.L. Watson (ANIC); 2♂♂, Behana Ck, 23.3.1992, G. Theischinger (GT); 2♂♂, Black Gin Ck, nr Rockhampton, March 1956, 1♂, 1♀, s. l., Jan. 1957, C. Vallis (ANIC); 1♀, Black Rock Ck, S of Proserpine, 30.10.1980, G. Theischinger (GT); 1♀, Blanco Falls, 19.10.1980, G. Theischinger (GT); 2♂♂, Bouldercombe, nr Rockhampton, 20.12.1955, R. Dobson (ANIC); 1♂, The Boulders, Babinda, 17-18.10.1967, R. Dobson (ANIC); 1♂, 1♀, The Boulders, via Babinda, 2.11.1966, J.A.L. Watson (ANIC); 1♂, Bulimba Ck, Brisbane, 12.12.1979, J.A.L. Watson, A. Arthington (ANIC); 3♂♂, Bushy Ck, at Mt Lewis Rd nr Mossman, 30-31.10.1966, J.A.L. Watson (ANIC); 1♂, 1♀, Camp Ck, nr Innisfail, 7.10.1967, R. Dobson (ANIC); 1♂, Carnarvon Gorge, Oct. 1959, C. Vallis, 1♂, s. l., 18-21.2.1980, G. Theischinger (GT); 1♂, Clohesy R., at Mareeba-Cairns rd, 6.11.1966, J.A.L. Watson (ANIC); 1♂, Coomera R., Macpherson Ra., Dec. 1955, E. Adams (ANIC); 6♂♂, 2♀♀, Dalrymple Ck, nr Macay, 14.11.1976, G. Theischinger (GT); 2♂♂, 1♀, Douglas Ck, nr Daintree, 22.11.1976, G. Theischinger (GT); 1♀, Freshwater nr Cairns, 4.10.1952, R. Dobson (ANIC); 3♂♂, 1♀, Gin-Gin, 11.11.1976, G. Theischinger (GT); 1♂, 1♀, Jourama Falls, 16.11.1976, G. Theischinger (GT); 1♂, Kroombit Tops, 14.10.1983, G. Theischinger (GT); 1♂, 1♀ (P), Kuranda, Dec. 1904, R. J. TILLYARD, 2♂♂, s. l., 15.1.1951, 1♂, s. l., 16.9.1953, R. Dobson (ANIC); 1♀, Innisfail, Mena Ck, 15.9.1953, R. Dobson (ANIC); 1♀, Lake Placid, Barron R., 25.10.1966, 1♂, s. l., 11.8.1968, J.A.L. Watson (ANIC); 1♂, L. Mulgrave R., 22.9.1953, R. Dobson (ANIC); 1♀, ck on Little Nerang Rd, 24.1.1965, A.F. O'Farrell (ANIC); 4♂♂, 2♀♀, Little Yabba Ck, nr Kenilworth, 9.11.1976 (GT); 1♀, swamp on Mareeba Rd, 8 mi. W of Kuranda, 19.4.1965, C.W. Frazier (ANIC); 1♂, Mena Ck, Paronella Park, Innisfail, 20.9.1952, 3♂♂, 2♀♀, s. l., 21.9.1952, 1♀, s. l., 7.10.1952, R. Dobson (ANIC); 1♀, Mervyn Ck, Kuranda, 2.10.1952, 1♂, s. l., 3.10.1952, R. Dobson (ANIC); 1♀, Millaa Millaa, 20.10.1980, G. Theischinger (GT); 1♂, 2♀♀, Millstream Falls, nr Ravenshoe, 19.11.1976, G. Theischinger (GT); 1♂, N. Mossman R., Mossman, 12.8.1968, J.A.L. Watson (ANIC); 1♂, 1♀, N. Mossman R., at Mossman-Daintree rd, 28.10.1966, J.A.L. Watson (ANIC); 2♂♂, 3♀♀, S. Mossman R., at Mossman-Cassowary rd, 1.11.1966, J.A.L. Watson (ANIC); 1♀, cks from Mt Haigh into Tinaroo Dam, Nov. 1982, G. Theischinger and L. Müller (GT); 1♂, Mt Tamborine, 2.1.1955, R. Dobson, 1♂, s. l., 9.11.1976, G. Theischinger (GT); 1♂, Nebo, 14.10.1980, G. Theischinger (GT); 2♂♂, n. o. d. (ANIC); 2♂♂, Oombunghi Ck, 4-5 mi. SSE Jarrahah Mission, 26.10.1966, J.A.L. Watson (ANIC); 2♂♂, 1♀, cks nr Rainbow Beach, 17.10.1983, G. Theischinger (GT); 1♂, 1♀, Redlynch, nr Cairns, 19.1.1951, R. Dobson (ANIC); 6♂♂, 3♀♀, Running R., Ewan rd, Paluma, 11.1.1968, R. Dobson (ANIC); 2♂♂, Searys Ck, nr Rainbow Beach, 5.12.1984, 2♀♀, s. l., 6.12.1984, G. Theischinger (GT); 1♂, ck S of Sarina, 30.10.1980, G. Theischinger (GT); 1♂,

40-50 km SW Sarina, 13.11.1976, G. Theischinger (GT); 1♀, stream draining W of Seymour Ra., N of Innisfail, 24.11.1966, J.A.L. Watson (ANIC); 1♂, Stoney Ck, Byfield, nr Yeppoon, 11.10.1955, R. Dobson (ANIC); 1♂, Tullebudgera Dam, 26.1.1965, A.F.O'Farrell (ANIC); 2♂♂, Tully, 11.1.1955, R. Dobson (ANIC); 1♂, 1♀, West Liverpool; Ck, 17.11.1976, G. Theischinger (GT); 1♂, Wollumbin Forest Res., March 1992, G. Theischinger and L. Müller (GT); 1♀, Yeppoon, 16.3.1963, C. Vallis (ANIC); 1♂, Zillie Falls, Theresa Ck, nr Millaa Millaa, 26.12.1967, R. Dobson (ANIC). New South Wales: 1♂, Bellinger R, 30.11.1911, 1♂, 1♀, s.l., 1.12.1911, R.J. TILLYARD, 1♂, 1♀, s.l., 4.2.1962, A.F. O'Farrell (ANIC); 5♂♂, 6♀♀, Cangai Ck, March 1992, G. Theischinger (GT); 1♂, Cudgera Ck, 14.1.1985, G. Theischinger (GT); 3♂♂, Georges Ck, 15.2.1962, A.F. O'Farrell (ANIC); 2♀♀, Koreelah Ck, 10 mi. S Wodenbong, 5.2.1968, R. Dobson (ANIC); 2♂♂, 2♀♀, Tooloom Ck, Wodenbong, 28.1.1955, R. Dobson (ANIC).

Diagnostic characters: Length of hindwing, male 22.0-26.0 mm, female 23.5-28.0 mm. Mature male with face orange and with sides of synthorax and abdominal segments 1, 2 and 7-10 pruinescent; superior anal appendages of male with caudal face more than twice as long as wide, inner end truncate.

Distribution: Queensland (except for Cape York), north-eastern New South Wales.

***Pseudagrion ignifer aureum* subspec. nov. (Figs 4-6)**

Pseudagrion ignifer TILLYARD: TILLYARD 1913: 469 (part); RIS 1915: 98 (part); TILLYARD 1926: 77 (part); LIEFTINCK 1951: 24; FRASER 1960: (part); WATSON 1974: 141 (part); HOUSTON & WATSON 1988: 50 (part); WATSON et al. 1991: 132, 133 (part); WATSON & HOUSTON 1994: 26 (part).

Types: Holotype ♂: Queensland, Cape York Peninsula, 12°44'S/143°14'E, 3 km ENE of Mount Tozer, 28.6.-4.7.1986, T. Weir & A. Calder (ANIC). Paratypes: Queensland, Cape York Peninsula: 1♀, same data as holotype, 1♂, type locality, 28.6.-4.7.1986, J.C. Cardale (ANIC); 1♀, Claudio River, Iron Range, 9.4.1975, M.S. Moulds (AM); 1♀, West Claudio River, Iron Range, 20.9.1974, M.S. Moulds (AM); 2♂♂, 20 km S Coen, 9.9.1974, M.S. Mould (AM); 1♂, Cooktown, R.J. TILLYARD (ANIC); 1♀, Gordon Creek, Iron Range, 16.4.1975, M.S. Moulds (AM); 1♂, Jardine River, 11°09'S/142°33'E, 13.10.1979, M.S. & B.J. Moulds (AM); 3♂♂, upper Jardine River, 11°13'S/142°39'E, 15.10.1979, M.S. & B.J. Moulds (AM); 3♂♂, upper Jardine River, 11°14'S/142°38'E, 16.10.1979, M.S. & B.J. Moulds (AM); 1♂, upper Jardine River, 11°18'S/142°36'E, 22.10.1979, M.S. Moulds (AM); 1♂, Little Laura River, N of Laura, 1.12.1974, M.S. Moulds (AM); 1♂, 1♀, Lockerbie Scrub, 12.4.1975, M.S. Moulds (AM); 1♂, Martin Creek, S of Iron Range, 24.10.1974, 3♂♂, s. l., 25.10.1974, M.S. Moulds (AM); 1♂, McLeod Creek, at McIvor River road, NW Cooktown, 26.3.1969, J.A.L. Watson (ANIC); 1♀, Mosquito Creek, S of Iron Range, 25.10.1974, M.S. Moulds (AM); 1♂, Pandanus Swamp, Mt Lomond, Iron Range, 19.4.1975, M.S. Moulds (AM); 1♂, 2♀♀, Pascoe River, 9.9.1984, c. u. (ANIC).

Name: *aureus* 3 = Latin for "golden", referring to the pale yellow face of the male.

Diagnostic characters: Length of hindwing, male 20.0-23.5 mm, female 22.0-25.0 mm. Mature male with face pale creme yellow and with sides of synthorax and abdominal segments 1, 2 and, rarely, 7-10 pruinose; superior anal appendages of male with caudal face markedly less than twice as long as wide, inner end widely truncate.

Distribution: Queensland (only Cape York).

***Pseudagrion lucifer* spec. nov. (Figs 7-10)**

Pseudagrion ignifer TILLYARD; LIEFTINCK 1933: 420; FRASER 1960: 16 (part); WATSON 1974: 141 (part); HOUSTON and WATSON 1988: 50 (part); WATSON et al. 1991: 132, 133 (part); WATSON & HOUSTON 1994: 26 (part).

Types: Holotype ♂: Western Australia, Hann River (Kimberley), 9.8.1968, G.F. Mees (ANIC). Paratypes: Western Australia: 3♂ ♂, 1♀, same data as holotype, 1♂, type locality, 8.8.1968, G.F. Mees (ANIC); 1♂, Barnett Range, near Manning Creek (Kimberley), 10-11.8.1968, G.F. Mees (ANIC); 8♂ ♂, 8♀ ♀, Barnett River Gorge, 8.8.1981, G. Theischinger (GT); 1♂, Mount Barnett, 9.8.1981, G. Theischinger (GT); 1♂, Elephant, King Leopold Range (Kimberley), 31.7.1968, 1♂, s. l., 1.8.1968, G.F. Mees (ANIC); 1♂, 15°38'S/125°15'E, 4 km W of King Cascade, 12-16.6.1988, T.A. Weir (ANIC); 1♂, Kings Cascades, Prince Regent River, 17.8.1994, L. Müller (GT); 1♂, 15°02'S/126°25'E, Drysdale River, 3-8.8.1975, I.F.B. Common & M.S. Upton (ANIC). Northern Territory: 1♂, 1♀, 12°47'S/132°51'E, Baroalba Springs, 19 km NE of Mount Cahill, 16.11.1972, J.A.L. Watson; 1♀, Daly River, Aboriginal Reserve, Chicken Hawk, nr Devil Devil Creek, 13°57'S/130°23'E, 2.10.1974, J.F. Hutchinson (ANIC); 1♀, Darwin River, 10.12.1979, J.A.L. Watson (ANIC); 1♂, Gordon Point, Melville Island, 18.6.1981, J.A.L. Watson (ANIC); 4♂ ♂, Howard Springs, 25.5.1970, J.A.L. Watson (ANIC); 1♂, Leaders Creek, Gum Point, 12.8.1982, 1♂, 3♀ ♀, s. l., 8.7.1983, c. u. (ANIC); 1♂, Rapid Ck, Darwin, 9.12.1970, J.A.L. Watson (ANIC); 1♂, Robin Falls, 12.5 km S of Adelaide River, 13°21'S/131°07'E, 27.7.1974, J.F. Hutchinson (ANIC); 1♂, Woolanning, Dec. 1979, L.R. Miller (ANIC); 1♂, 1♀, 1♂, 1♂, 1♂, 1♀, 1♀, 1♂, 1♂, 1♂, AN07 00017-00025 (ANIC).

Name: *lucifer* = Latin for "morning-star", referring to the bright face of the male.

Diagnostic characters: Length of hindwing, male 21.0-24.0 mm, female 21.0-24.0 mm. Mature male with face bright yellow and with sides of synthorax and abdominal segments 1 and 2 pruinose; superior anal appendages of male with caudal face markedly less than twice as long as wide, inner end subtriangular.

Distribution: Western Australia (Kimberley region), Northern Territory.

Zoogeography

The available data indicate that the three distinct groups of populations of the *Pseudagrion ignifer* complex are allopatric. *P. ignifer ignifer* TILLYARD is now known to range from north-eastern Queensland to north-eastern New South Wales (south of latitude ca 16°S, east of longitude ca 145°E). *P. ignifer aureum* subspec. nov. is apparently restricted to Cape York Peninsula north of latitude ca 16°S, whereas *P. lucifer* spec. nov. is known from the north of Western Australia and from Northern Territory (west of longitude ca 133°E, north of latitude ca 18°S).

It is assumed that *P. ignifer* and *P. lucifer* are completely isolated from each other geographically. It is, however, not excluded that there is contact between *P. i. ignifer* and *P. i. aureum* even though specimens bridging the morphological gap have not yet been found.

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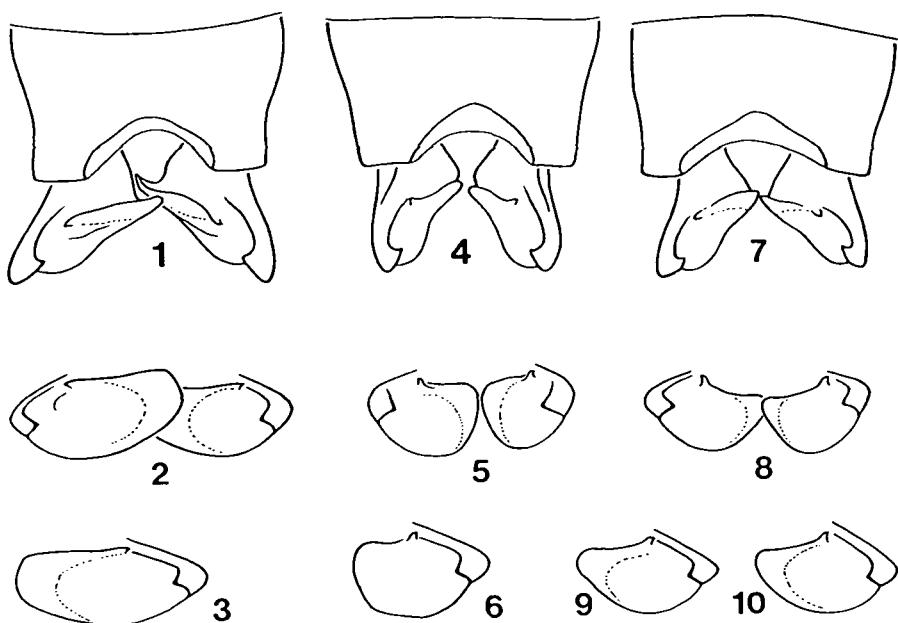
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Figs 1-10. *Pseudagrion* spp., male anal appendages, dorsal and caudal aspect, and posterior outline of single appendage: 1-3, *P. ignifer ignifer* Tillyard; - 4-6, *P. ignifer aureum* ssp. n.; - 7-10, *P. lucifer* sp. n. (9, from Kimberleys, Western Australia; - 10, from Northern Territory).